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10/698,926	10/31/2003	D. Amnon Silverstein	200206546-1	2987

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EXAMINER

MADDEN, GREGORY VINCENT

ART UNIT	PAPER NUMBER
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2622

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/698,926	Applicant(s) SILVERSTEIN, D. AMNON	
	Examiner Gregory V. Madden	Art Unit 2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 April 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 24-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 and 27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input checked="" type="checkbox"/> Other: <u>WO 01/99431</u> |

DETAILED ACTION

Election/Restrictions

Claims 24-26 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Invention II, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on April 30, 2007.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6, 10, 11, 15-19, 23, and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Cathey et al. (WO 01/99431).

First, regarding **claim 1**, the Cathey reference discloses an imaging apparatus comprising an image sensor including a plurality of color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406) comprising a plurality of sensors configured to provide image data for a plurality of pixels of a respective color component (red, blue and green) at an initial resolution, wherein the plurality of color sensor arrays overlap (red overlaid by blue; blue overlaid by green) and are offset with respect to one another (each array offset by 1/3 of a pixel to the other) to define a plurality of sub-pixels for individual ones of the pixels. Finally, Cathey teaches that the apparatus includes processing circuitry (inherently provided to perform digital signal processing, as taught in the final paragraph of Pg. 6) configured to access the image data for at least one pixel from each of the plurality of color sensor arrays, and using the

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accessed image data, to determine sub-pixel image data for the respective sub-pixels to form an image of increased resolution compared with the initial resolution of the color sensor arrays. Please refer to Fig. 4, and Pgs. 1-6.

As for **claim 2**, the limitations of claim 1 are set forth above, and Cathey further discloses that the arrays comprise a plurality of photodetectors at individual pixels (inherent in CCD architecture) to detect respective color components of light (i.e. red, green, and blue color components of light). Again, please refer to Fig. 4, and Pgs. 1-6.

Considering **claim 3**, the limitations of claim 1 are again set forth above, and Cathey also teaches that each of the sub-pixels (offset pixel sub-regions shown in Fig. 4) comprise red, green, and blue color components, and the plurality of color sensor arrays comprise red, blue, and green color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406). Please refer to Pgs. 1-6.

In regard to **claim 4**, Cathey teaches the limitations of claim 3 above, and the Cathey reference further shows that the overlapping the red (402), green (406), and blue (404) color sensor arrays enables determination of image data at an increased number of physical locations within the individual ones of the pixels to create an image of a higher resolution at a sub-pixel level. Once again, please refer to Fig. 4, and Pgs. 1-6.

As for **claim 5**, the limitations of claim 1 are taught above, and Cathey teaches that the increased resolution image is created by determining sub-pixel image data for individual pixels using the image data from each of the plurality of color sensor arrays, as is specifically disclosed in Pgs. 3-4.

Regarding **claim 6**, again the limitations of claim 1 are set forth above, and Cathey discloses that the offsetting of the color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406) is performed by physically shifting the plurality of color sensor arrays in a desired direction (i.e. offsetting each overlapping array by 1/3 of a pixel in the vertical and horizontal direction). Again, please refer to Fig. 4, and Pgs. 1-6.

Next, considering **claim 10**, Cathey teaches an imaging apparatus comprising an image sensing means including a plurality of color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406), individual sensor arrays comprising a plurality of sensor means for providing image data for a plurality of pixels of a respective color component at an initial resolution, wherein individual ones of the sensor means are arranged in a layered stack (overlaid stack of red CCD 402, blue CCD 404, and green CCD 406) for individually detecting red, green, and blue components of light, respectively, and wherein the plurality of sensor means of respective color sensor arrays are arranged in an offset relationship (i.e. offsetting each overlapping array by 1/3 of a pixel in the vertical and horizontal direction) with respect to one another for defining a plurality of sub-pixels for individual ones of the pixels. Further, Cathey teaches processing means (digital signal processing means) for accessing the image data for at least one pixel from each of the plurality of color sensor arrays, and using the accessed image data to form an image of an increased resolution (e.g. reconstruction) compared with the initial resolution of the color sensor arrays. Please refer to Fig. 4, and Pgs. 1-6.

As for **claim 11**, the limitations of claim 10 are set forth above, and Cathey discloses that the offsetting of the color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406) is performed by physically shifting the plurality of color sensor arrays in a desired direction (i.e. offsetting each overlapping array by 1/3 of a pixel in the vertical and horizontal direction). Again, please refer to Fig. 4, and Pgs. 1-6.

Regarding **claim 15**, again the limitations of claim 10 are taught above, and Fig. 4 of the Cathey reference illustrates that the sensor means (402, 404, and 406) are offset in a depthwise direction with respect to a direction of received light.

Considering **claim 16**, again the limitations of claim 10 are set forth above, and Cathey also discloses that the processing means (digital signal processing means) comprises means for determining the sub-pixel image data for the respective sub-pixels (e.g. during reconstruction) of an individual pixel

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using the accessed image data of the respective individual pixel, and the processing means further comprises means for forming an image of increased resolution. Please refer to Fig. 4, Pgs. 1-6, and Pg. 9.

Next, in regard to **claim 17**, Cathey teaches an image data processing method comprising providing image data using an image sensor, further comprising configuring a plurality of color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406) to overlap (or overlay) one another in an offset relationship (i.e. offsetting each overlapping array by 1/3 of a pixel in the vertical and horizontal direction) to define a plurality of sub-pixels for individual ones of a plurality of pixels, wherein individual color sensor arrays comprise a plurality of sensor elements configured to provide the image data for the plurality of pixels of a respective color component (red, green, or blue) at an initial resolution, accessing the image data for at least one pixel from each of the plurality of color sensor arrays (i.e. reconstruction, as shown in Fig. 7), and forming an image having an increased resolution compared with the initial resolution of the color sensor arrays using the accessed image data. Please refer again to Fig. 4, Pgs. 1-6, and Pg. 9.

Regarding **claim 18**, the limitations of claim 17 are set forth above, and Cathey discloses that the forming of an image comprises determining sub-pixel image data from the accessed image data, and using the sub-pixel image data to form the image having increased resolution. See Pgs. 1-6 and 9, as well as Fig. 7.

As for **claim 19**, again the limitations of claim 17 are set forth above, and the Cathey reference teaches that the image having increased resolution is formed at a sub-pixel level, as illustrated in Fig. 7 and taught in Pgs. 1-6, and Pg. 9.

Considering **claim 23**, the limitations of claim 17 are shown above, and Cathey discloses that the offsetting of the color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406) is performed by physically shifting the plurality of color sensor arrays in a desired direction (i.e. offsetting each

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overlapping array by 1/3 of a pixel in the vertical and horizontal direction). Again, please refer to Fig. 4, and Pgs. 1-6.

Finally, in regard to **claim 27**, the Cathey reference teaches an article of manufacture comprising a processor (digital signal processor) caused to access image data for at least one pixel from a plurality of color sensor arrays at an initial resolution, form an image of increased resolution, compared with the initial resolution of individual ones of the color sensor arrays (red CCD 402, blue CCD 404, and green CCD 406), using the accessed image data, wherein the color sensor arrays are offset with respect to one another (i.e. offsetting each overlapping array by 1/3 of a pixel in the vertical and horizontal direction) providing a plurality of image data values for at least one color component for a single pixel location. See Figs. 4 and 7 and Pgs. 1-6 and 9. While Cathey does not specifically disclose that the article of manufacture comprises a processor-usable medium comprising processor usable code configured to cause the processing circuitry to do the above processing, it is inherent that the digital signal processing circuitry contains a processor-usable medium comprising processor usable code to perform the reconstruction method of Cathay to increase the image resolution.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7-9, 12-14, and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cathey et al. (WO 01/99431) in view of Yamanaka et al. (U.S. Pat. 5,760,832).

Next, considering **claim 7**, the limitations of claim 1 are taught above by the Cathey reference, but Cathey only teaches that the offsetting of the color sensor arrays is performed by physically shifting the color sensor arrays, as taught by claim 6 above, not that the offsetting is performed by using an optical device. However, the Yamanaka reference teaches an imaging apparatus wherein the offsetting of color sensor arrays (CCDs 17, 18, and 19) is performed by using an optical device (optical system 14 containing color separating prism 16), as taught in Col. 6, Line 22 – Col. 7, Line 66 and Figs. 4-8. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the use of an optical device to perform the offsetting of the color sensor arrays, as taught by Yamanaka, with the apparatus of Cathey. One would have been motivated to do so because by using the optical device to redirect the red, green, and blue light to the respective CCDs, the light is less likely to be filtered or distorted as it would through the stacked orientation of color sensor arrays as taught by Cathey.

As for **claim 8**, the limitations of claim 7 are taught above, and Yamanaka also teaches that the optical device is a prism (color separating prism 16) in Col. 6, Lines 35-44.

Regarding **claim 9**, again the limitations of claim 7 are set forth above, and Yamanaka also teaches that the optical device is a lens (optical system 14 is a phototaking lens system), as is disclosed in Col. 6, Lines 22-23.

Next, considering **claim 12**, the limitations of claim 10 are taught above by Cathey, but Cathey only teaches that the offsetting of the color sensor arrays is performed by physically shifting the color sensor arrays, as taught by claim 6 above, not that the offsetting is performed by using an optical device. However, the Yamanaka reference teaches an imaging apparatus wherein the offsetting of color sensor arrays (CCDs 17, 18, and 19) is performed by using an optical device (optical system 14 containing color separating prism 16), as taught in Col. 6, Line 22 – Col. 7, Line 66 and Figs. 4-8.

As for **claim 13**, the limitations of claim 12 are taught above, and Yamanaka also teaches that the optical device is a prism (color separating prism 16) in Col. 6, Lines 35-44.

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Regarding **claim 14**, again the limitations of claim 12 are set forth above, and Yamanaka also teaches that the optical device is a lens (optical system 14 is a phototaking lens sytem), as is disclosed in Col. 6, Lines 22-23.

Next, in regard to **claim 20**, the limitations of claim 17 are taught above by the Cathey reference, but Cathey only teaches that the offsetting of the color sensor arrays is performed by physically shifting the color sensor arrays, as taught by claim 6 above, not that the offsetting is performed by using an optical device. However, the Yamanaka reference teaches an imaging apparatus wherein the offsetting of color sensor arrays (CCDs 17, 18, and 19) is performed by using an optical device (optical system 14 containing color separating prism 16), as taught in Col. 6, Line 22 – Col. 7, Line 66 and Figs. 4-8.

As for **claim 21**, the limitations of claim 20 are taught above, and Yamanaka also teaches that the optical device is a prism (color separating prism 16) in Col. 6, Lines 35-44.

Finally, regarding **claim 22**, again the limitations of claim 20 are set forth above, and Yamanaka also teaches that the optical device is a lens (optical system 14 is a phototaking lens sytem), as is disclosed in Col. 6, Lines 22-23.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Howell (U.S. Pat. 6,570,613)

Lee (U.S. Pat. 5,442,394)


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory V. Madden whose telephone number is 571-272-8128. The examiner can normally be reached on Mon.-Fri. 8AM-5PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ngoc Yen Vu can be reached on 571-272-7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gregory Madden
May 7, 2007


NGOC-YEN VU
SUPERVISORY PATENT EXAMINER